



Governor's Office of
Economic Development

Centers of Excellence

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ANNUAL REPORT

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2004-2005
Centers of Excellence
Annual Report

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Executive Summary

Executive Summary CENTERS OF EXCELLENCE 2004-05 ANNUAL REPORT

The Centers of Excellence program has a nearly 20 year history of helping to mature technologies developed at Utah's colleges and universities and bring them into the marketplace. Throughout its history the program has spun out many startups as well as supported many existing Utah companies through licensing of compelling, unique technologies.

The purpose of the Centers of Excellence Program (COEP) is to accelerate the commercialization of promising technologies that have value for Utah.

Since its inception in 1986, the program has helped create thousands of high-tech jobs, assisted in the creation of spin-off companies, and through improving products and processes has helped hundreds of Utah's high-technology companies experience tremendous growth. Over the first 19 years of the program, the Centers of Excellence Program has generated 179 patents, resulting in 204 license agreements, and 175-plus Utah-based companies have been created to license and market proprietary technology from the program. As of the last audit (2003), those companies directly employed over 2008 persons in the state, at an average wage of \$59,000.

Examples of significant success of the Centers of Excellence program include [Myriad Genetics, Inc. \(MYGN\)](#), [Sonic Innovations, Inc. \(SNCI\)](#), [Theratech](#) - Acquired by Watson Pharmaceuticals (WPI), and [Echelon Biosciences Inc.](#) - An Aeterna Zentaris Company (AEZS). Emerging successes include [TechniScan Medical Systems, Inc.](#), [PartNET, Inc.](#), [Intelisum, Inc.](#), and [Sarcos, Inc.](#) Startups emerging from the Centers program in the past two years include [Wasatch Microfluidics Inc.](#), [Intellivis LLC](#), Castlerock Engineering, INOTEC INC, [Glycosan Biosystems](#), and [Sentrx Animal Care](#). These firms, and many more, continue to generate new jobs in Utah and strengthen Utah's high tech business community and are strong examples of the compelling research being created in Utah's colleges and universities.

For the 2004-05 year, 18 Centers of Excellence received funding totaling approximately \$2 million, including 7 Centers that are new to the program. Technologies range from the profitable use of agricultural byproducts to new therapeutic biomaterials to state of the art software. Universities represented in the program this year include Brigham Young University, the University of Utah and Utah State University. Each Center works with a business consultant who assists in developing industry contacts, developing business plans and otherwise developing a "go to market" strategy and plan.

2004-2005 Funded Centers

Advanced Communications Technology

B R I G H A M Y O U N G U N I V E R S I T Y

CENTER

The Center for Advanced Communications Technology was formed to commercialize multi-antenna wireless communications: the main focus is using multiple antennas for robust wireless links to maneuvering air vehicles (tactical aircraft and UAV's). A secondary focus is in applying multi-antenna technology to improvement of commercial wireless communications. The Center has forged strong links with industry and with government as they've developed and refined the technology.

TECHNOLOGY

The Center designs solutions that help compensate for interference in wireless signals, with a particular emphasis on solutions for aircraft performing difficult maneuvers such as rolls as well as new solutions for helicopters communicating with a satellite. Historically these solutions have been focused on multi-antenna systems, but recent breakthroughs allow a single receiver to detect either of the two waveforms currently adopted for telemetry transmission.

ACCOMPLISHMENTS

The Center has filed 3 provisional patents and continues to demonstrate the success of their technology with a successful prototype flight-test held at Edwards Air Force Base. In March, the Center secured nearly \$900,000 in funding from the US DOD to develop a real time prototype of the system which is scheduled for completion in the summer of 2006. Ongoing development has allowed the concept to be applied to helicopters communicating with satellites (where moving rotors interrupt communication). In addition, the Center has developed new telemetry technology which allows a single hardware system to be used to accommodate two distinct communication waveforms



THINK TANK

What if there was...

**A way for a rolling
Air Force jet to
always stay in
communication
with the ground,
even when the
wings and tail
interfere with the
signal ?**

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Advanced Imaging LADAR

U T A H S T A T E U N I V E R S I T Y

CENTER

This Center focuses on commercializing three dimensional camera intellectual property based on laser radar (ladar) and digital camera technology. This year the Center succeeded in developing a new 3D camera prototype that is convenient and affordable for field work. It has been licensed and sold to Rappidmapper, Salt Lake City, Utah and has already been used in Japan, Alaska and various other states in the U.S. Unexpectedly, the successful prototype generated interest from NASA for space applications.

TECHNOLOGY

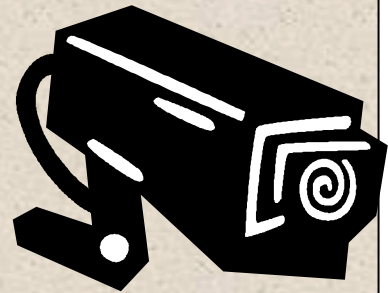
The CAIL technology, called the 3D Texel Camera uniquely combines (1) three-dimensional Laser Detection And Ranging (3D LADAR) technology with 2- dimensional digital photography (2D Imagery). 3D LADAR measures the precise distance to, and shape of, objects or terrain in a scene. 2D imagery records the color (or spectra) of the objects or terrain. CAIL's technology records the looks of a scene and the exact distance to objects in the view. It can take numerous images and integrate them all in real time. The system will be the first in the world to enable precise 3-D color imagery when either the scene or the camera or both are moving.

ACCOMPLISHMENTS

A new patent has been filed entitled "System and Method for Improving Lidar Data Fidelity Using Pixel-Aligned Lidar/Electro-Optic Data". This technology will enable automatic assembly of multiple 3D data sets (pictures) to create one big picture of the scene. The automation will increase the efficiency of use of data produced by the 3D camera prototype. Experimental work has been completed on a small handheld LADAR, this will be integrated into a new smaller 3D camera prototype during FY05-06.

THINK TANK

What if there was...



**A way to take a picture and have a true, 3D image of the world?
What if we could map the world with such a system?**

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Advanced Satellite Manufacturing

U T A H S T A T E U N I V E R S I T Y

CENTER

The Center for Advanced Satellite Manufacturing is seeking to create a viable Utah-based satellite manufacturing enterprise based upon years of expertise and projects within Utah State University and its Space Dynamics Laboratory. The Center is pursuing the development of novel advanced manufacturing and design techniques to reduce the cost and time involved with satellite manufacturing while improving quality and performance.

TECHNOLOGY

The Center received \$25,000 of seed money during the '04-'05 year. This money enabled the Center to seek and win STTR funding from the National Science Foundation and to increase its visibility to outside organizations by participation in conferences, presentations at government and industry locations, and development of new proposals for funding. It also provided impetus for USU to spend \$185,000 of its own money to purchase the Ultrasonic Consolidation equipment necessary for furthering the research in this area.

Ultrasonic Consolidation is the primary advanced manufacturing technology upon which advanced satellite manufacturing techniques are being developed. Combining advanced manufacturing tools with new design techniques should yield highly modular and easy to build, reliable satellites that can accommodate a wide variety of different functions, thus placing Utah in the leadership in small satellite manufacturing.

ACCOMPLISHMENTS

Establishment of the Center and building the infrastructure needed for future work in this area.

THINK TANK

What if there was...



A way to make modular, standardized small satellites so that the development of new satellites with new functions was "plug and play"?

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Biomedical Microfluidics

U N I V E R S I T Y O F U T A H

BIOMEDICAL MICROFLUIDICS

The primary focus of the Center for Biomedical Microfluidics is to develop and deliver to market a device for the creation of microarrays composed of proteins, nucleic acids, cells, lipids, sugars, or other materials. The system is unique in that it delivers spots of the desired materials in a system similar to an inkjet printer, providing low cost, high accuracy arrays for the biomedical industry. As part of this focus, the Center is working to develop new applications of the technology and to expand the number and quality of spots that can be produced simultaneously. The elements of the commercialization plan include: partnering with OEMS who will incorporate the spotter in existing sensing tools, researchers and research companies who will use a stand alone spotter to produce their own chips and establish their own protocols for depositing biomaterials and Microarraying companies that produce microarrays and other platforms requiring small spots.

TECHNOLOGY

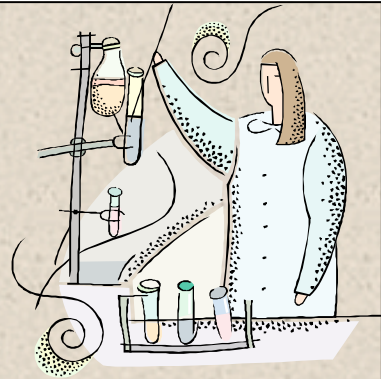
This year, in addition to the existing Continuous Microfluidic Spotter for Proteins and Nucleic acids (DNA), the Center has added the same capabilities for Cells and Lipids. In addition, the Center has collaborated with the Center for Homogenous DNA to develop systems for DNA extraction, amplification, and sensing arrays using microfluidics. Peripheral areas such a micropump design uses an Osmotic pump for delivery over 1 month as well as a Diffusion pumping system are also in development.

ACCOMPLISHMENTS

The Center's accomplishments this year include:

- Generation of over \$600,000 in external funding related to Center technologies
- Five new invention disclosures submitted and 2 provisional patent applications filed
- Generation of significant leads for licensing opportunities

In addition, the Center has a spinout, Wasatch Microfluidics, which has been created to assist in taking the Center's technology to market.



THINK TANK

What if there was...

A way to “print”
biomedical
compounds onto
a slide, quickly,
easily and
inexpensively?

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COMPLIANT MECHANISMS

B R I G H A M Y O U N G U N I V E R S I T Y

CENTER

The objective of the Compliant Mechanisms Center is to help rapidly move the design of a wide variety of compliant mechanisms into industry. A compliant mechanism transfers or transforms motion, force, or energy, but, unlike rigid-link mechanisms (such as traditional pliers), compliant mechanisms gain at least some of their mobility from the deflection of flexible members rather than from movable joints only. During its final year in the program, the Center focused its efforts on the successful completion of projects aimed at finalizing licenses and patent applications.

ACCOMPLISHMENTS

By reducing the number of parts, reducing or eliminating the need for lubrication, reducing weight and easing miniaturization, the use of innovative compliant mechanisms can give companies a significant advantage in the marketplace over traditionally designed products.

The Center has designed and tested many compliant mechanisms in partnership with industry ranging from exercise and athletic equipment components, electric switches, clutches and transmissions, and prosthetics. During the 5 year life of the Center, the team has filed 15 patents and 9 of them have been issued.

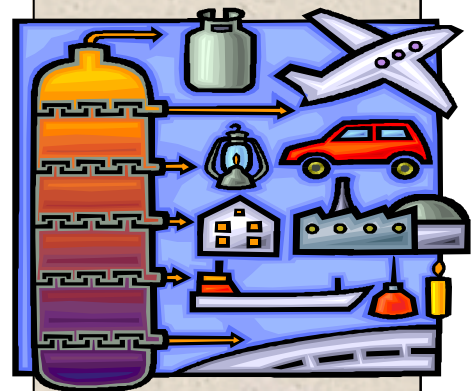
TECHNOLOGY

The range of technologies developed by the Center can be categorized under Advanced Bicycle components, Power Transmissions, Force Displacement Systems, Bistable Mechanisms and Microelectromechanical Systems (MEMS). Utah companies such as ATL, Inc., and Happy Jack, Inc. have benefited from the Center's work.

THINK TANK

What if there was...

A way to dramatically simplify the design of mechanical components to reduce cost, complexity, weight and the need for lubrication?



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CASPeR

U N I V E R S I T Y O F U T A H

CENTER

The Center for Alternate Strategies of Parasite Removal (CASPeR) is preparing to commercialize a safe, nontoxic and rapid treatment for Pediculosis (head lice), a multibillion-dollar, increasingly resistant problem afflicting some 25% of children by the time they are teenagers.

TECHNOLOGY

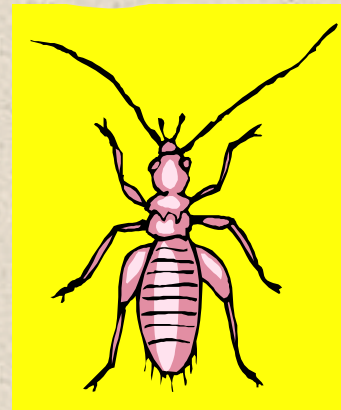
CASPeR has developed a device - the LouseBuster™ - is a revolutionary new approach for eradicating head lice. It is a non-chemical approach that controls lice by rapidly desiccating (drying) them out with blasts of warm air applied to the scalp. Lice and their eggs (nits), which are glued to the hair, are vulnerable to desiccation because of their high surface to volume ratio. The LouseBuster™ blows more than twice as much air as a standard blow dryer, but at a temperature of only 140°F (blow dryers operate at 150-160°F). It kills lice remarkably quickly - normally in less than 30 seconds. In addition to killing hatched lice, the LouseBuster™ also kills eggs, which shampoos have never been able to do. Shampoos require two applications, 7-10 days apart, in order to kill eggs that hatch after the first treatment. In short, the LouseBuster™ represents a potential "magic bullet" solution to head lice that differs completely from previous methods.

ACCOMPLISHMENTS

The Center submitted a full patent application in May '05. The Center also created a LouseBuster™ beta prototype for human use including the development of a disposable hand piece attachment for the LouseBuster™. The Center also conducted significant human clinical testing of the LouseBuster™ alpha prototype with success approaching a 100% cure rate. The Center also continued to expand relationships with local schools, clinics and other entities. During the year the Center treated about 100 families in the Salt Lake Valley for head lice, thus alleviating significant trauma for these families, and their schools. The LouseBuster treatments allowed children to return to school earlier than would have otherwise been possible, benefiting schools and families.

THINK TANK

What if there was...



A safe, non-toxic way to thoroughly kill head lice in a 1 hour, non-chemical treatment? What if that were to help the 25% of children in the U.S. who get head lice before they're teens?

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Direct Machining and Control

B R I G H A M Y O U N G U N I V E R S I T Y

CENTER

This Center is developing a software-based digital control architecture configured on a host computing device to control, in real-time, a distributed high speed network of motors, sensors and other I/O devices. The vision is for a PC-controlled and networked enabled direct control manufacturing environment enabling multiple machine tools to be run by one operator, through a network, rather than individual operators, delivering dramatic cost savings.

TECHNOLOGY

The DMAC technology is based on an open architecture controller and supporting control algorithms for general control of mechanisms such as 5-axis machine tools. The primary focus in the Center is software development, including object oriented libraries that integrate motion planning, trajectory generation, servo-control, communication and user interfaces, with some supporting hardware. Hardware includes dual CPU control processors, machine tool enabled Coordinate Measurement wireless hardware, and Ethernet enabled sensor boards and motor control boards. The advantage of this new distributed approach to control is reduced control hardware, control of distributed rather than collected devices, reduced control costs, and greater control flexibility through modern control methods that cannot be enabled under the restrictions of modern controllers.

ACCOMPLISHMENTS

Technical progress has continued across numerous fronts, with significant progress on new algorithms to improve direct machining performance. Direct Controls, Inc., a spin-off company in Orem, Utah, has released the first direct controlled machining robot. In addition, in ongoing commercialization work, the Center is tackling the issue of how to deliver its disruptive technology into industry and is receiving strong support from key industry players.



Recent product released by Direct Controls, Inc. is the first direct controlled machining robot

THINK TANK

What if there was...

A way to dramatically reduce the cost of manufacturing by putting control of an entire manufacturing process in the hands of one or two skilled operators, and a direct machining technology infrastructure?

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Global Knowledge Management

U N I V E R S I T Y O F U T A H

CENTER

Since its inception in mid- 2003, the Global Knowledge Management Center (GKMC) has been defining, creating, and offering technologies, products and services based on data mining and optimization methods that enhance and sustain return on investment in data. The Center has selected web optimization as the initial application domain of its technologies, before expanding the scope to include homeland security, bio-medical, financial and marketing applications.

TECHNOLOGY

GKMC has focused on the following process for selecting and creating our technologies/products/services:

- Developing or applying data mining algorithms that discover patterns or relationships useful for better understanding problems, performance evaluations and solutions automation.
- Defining and evaluating meaningful metrics to better assess or predict the states of the world pertaining to important problems. Such metrics typically are dependent on the discovered patterns.
- Developing automated algorithms that optimize or enhance the states in a problem domain.

ACCOMPLISHMENTS

One major accomplishment of the Center this year has been to develop automated solution algorithms to provide web site operators with automated suggestions of ways to improve their site's performance. During this year the center Completed a pre-beta version of the Aculink software system that provides link recommendations and link performance metrics using the Link Selector algorithm and developed and tested a variety of new algorithms to improve the value of the system.

In addition, the Center developed and evaluated web-based and email-based investment recommendation sharing workflow for potential value to financial knowledge management and decision support. This technology could evolve into investment recommendation and knowledge management portal for the large Internet community.

THINK TANK

What if there was...



**A way for
companies who
depend on the
web to optimize
their website to
maximize customer
satisfaction as well
as web-based
transactions?**

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High-Speed Information Processing

U T A H S T A T E U N I V E R S I T Y

CENTER

The Center for High-Speed Information Processing (CHIP) bridges the gap between university research and industrial applications in the field of advanced algorithms for a variety of signal processing applications. Companies often need to see a proof-of-concept before licensing a signal processing algorithm. CHIP builds demonstrable prototype systems in a variety of different industrial applications, including a range of voice applications.

TECHNOLOGY

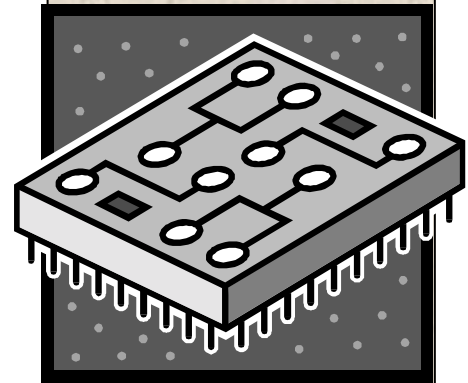
In addition to existing signal processing technologies developed by the Center, this year CHIP has developed or improved a variety of new algorithms such as a convolutional decoder, Viterbi algorithm, various rates and codes (software/hardware) as well as an LDPC decoder, various rates and codes, and DVBS2 software and hardware. These technologies all improve the area of digital sound and digital voice, with a particular emphasis on reducing echoes and feedback. Commercial applications include hearing aids and speakerphones.

ACCOMPLISHMENTS

CHIP has spent the current year working to transfer its technology and experience into the commercial market, with particular emphasis on its partnership with SP Communications, Inc., an advanced speakerphone licensing partner of the Center. Overall CHIP is working to deliver faster, more powerful signal processing algorithms on smaller integrated circuit chips and their work is being well received in all areas of this field as it helps to reduce size, complexity and power usage for new devices.

THINK TANK

What if there was...



A way for audio devices to be smaller, lighter and use less power because of advanced information processing algorithms?

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Homogeneous DNA Analysis

U N I V E R S I T Y O F U T A H

CENTER

This Center, in its second year, continued their innovative work to commercialize rapid “hands-off” DNA testing. In the past year the Center has demonstrated the feasibility of “repeat typing” (for genetics and identity testing), “sequencing”, and transplant compatibility testing using their rapid, low cost methods. A new development is gene dosage assessment, such as a simple test for trisomy 21 that may replace more complicated cytogenetic analysis. These innovations have application in cancer testing, the diagnosis of inherited diseases, and rapid bioterrorism detection.

TECHNOLOGY

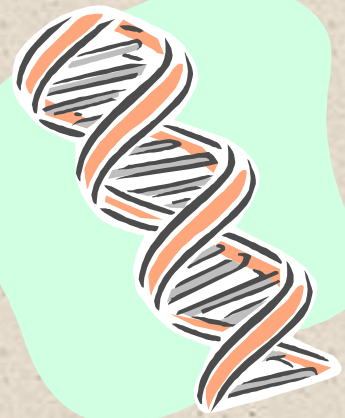
The central innovation of this Center involves High Resolution DNA melting analysis which is performed in solution, as in a test tube, in only 1-2 min without requiring any processing. This technique uses high-resolution, fluorescent melting analysis which means that a fluorescent dye, added before amplification via polymerase chain reaction (PCR), allows the melting transition of the PCR product to be continuously monitored. Ongoing work within the Center aims to apply it to new problems. Major new techniques this year include unlabeled probe genotyping, simultaneous mutation scanning and genotyping allele fraction assessment (more sensitive than sequencing), and “micro-melting” (scaling down 1000-fold to 10 nl samples).

ACCOMPLISHMENTS

This year the feasibility of sequencing and repeat typing by melting was demonstrated, a blind clinical trial of transplant matching completed, and software tools for assay design and analysis have been developed. The Center’s main licensee, Idaho Technologies, Inc. has launched two DNA melting instrument platforms based on the technologies, with both having very good early sales results. In addition, two Phase II STTRs are funded that directly result from Center technology at a value of \$1.7M in research funds. The estimated total value of the benefit received to the State so far is just under \$3M.

THINK TANK

**What if there was
a way to...**



**Know “on the
spot” if a potential
transplant organ
was a genetic
match, which dra-
matically reduces
the risk of organ
rejection.**

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Miniature Unmanned Air Vehicles

B R I G H A M Y O U N G U N I V E R S I T Y

CENTER

The main focus of the Center is the development of technologies to extend the capabilities of autonomous miniature air vehicles (AMAVs, also referred to as UAV's) and to license those technologies which are commercially viable. An AMAV may only be a couple of feet across and, with such a small size, AMAVs permit remote surveillance, information gathering and other functions that are either too expensive or dangerous with current technologies. The vision of the Center is to enable "anyone" to fly an AMAV, without complex skills, and to extend the abilities integrated into the AMAV to a wide variety of commercial applications.

TECHNOLOGY

The Center is advancing a variety of technologies crucial to this vision of the turnkey AMAV.

- Inexpensive turnkey AMAV – a fully integrated system
- Easy-to-use, intuitive user interfaces for non-pilot AMAV operation (including PDA based control)
- Pan and tilt camera gimbal system for AMAVs
- "Eye-on-Target" video surveillance, monitoring, and targeting with AMAVs
- AMAV with integrated synthetic aperture radar (SAR)
- Video image stabilization

ACCOMPLISHMENTS

Procerus Technologies of Vinyard, Utah is a major licensee of the Center and is in the second year of commercial shipments of UAV systems and components. The Center continues development of innovative new technologies of interest both to Procerus and to potential partners in other vertical markets. In addition, the Center continues to receive strong support from Federal, military and other funding sources.

THINK TANK

What if there was...



A way to fly a miniature plane over a chemical leak or forest fire in order to evaluate the damage or range of the disaster, and to do it using a handheld PDA as the control system?

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Nanosize Inorganic Material Powders

U N I V E R S I T Y O F U T A H

CENTER

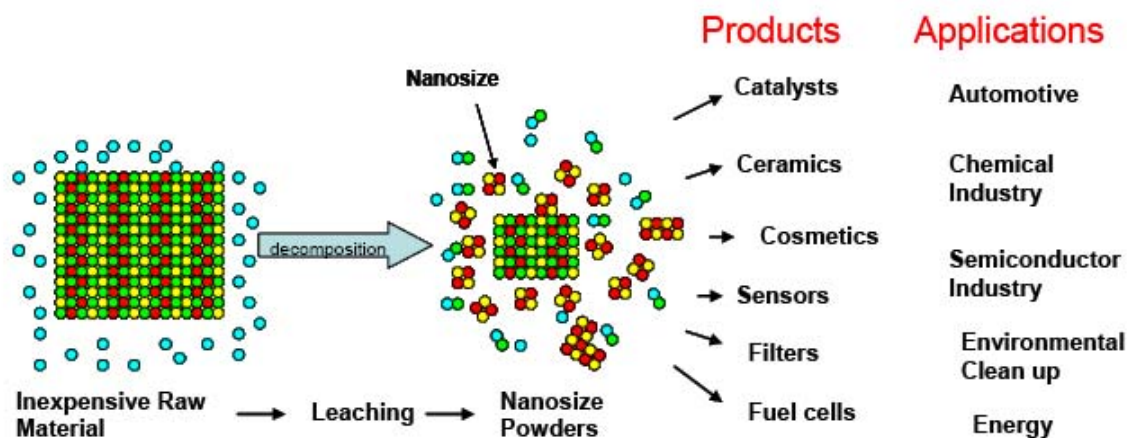
The main focus of this new Center has been to synthesize nanosize oxide powders by a low-cost, commercially scalable process using low-cost precursors. These powders find applications in numerous technologies. During the past year, one patent application was filed and one patent was issued. During the year, the use of nanosize powders in sensors and as a material for fuel cells, an energy conversion device which converts chemical energy of fuels directly into electricity was explored.

THINK TANK

What if there was...

A way that inexpensive raw materials could be easily converted into nanosize powders to enable a wide array of com-

TECHNOLOGY



ACCOMPLISHMENTS

This year the Center Synthesized nanosize powders of ZrO_2 , CeO_2 , TiO_2 , BaTiO_3 , and SrTiO_3 , initiated a number of contacts with potential commercial partners and began planning for one or more business ventures for the commercialization of nanosize powders for ceramic manufacture and catalysts and for the fabrication and commercialization of sensors and filters.

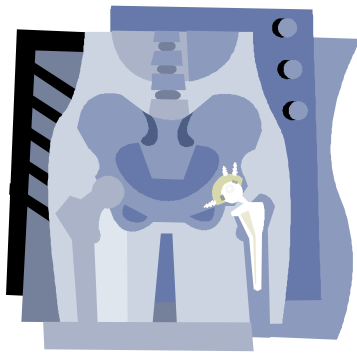
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Novel TiB Surface Hardening

U N I V E R S I T Y O F U T A H

CENTER

Now in its second year, this Center is commercializing a variety of materials that use boron to harden and otherwise improve the performance of titanium under applications with a lot of wear. The unique advantages of the TiB surface hardening technology include



a stable surface layer, hardness and wear resistance coupled with electrical conductivity ideal for applications such as biomedical implants (i.e. hip/knee replacements), bearings and cutting tools. The nanostructured bulk titanium boride and the functionally graded titanium boride are novel material technologies for innovative applications such as armor, gun barrels and die inserts.

TECHNOLOGY

The Center technology involves the (i) incorporation of titanium monoboride (TiB) crystals to harden the surfaces of titanium, (ii) creation of nanostructured titanium boride bulk material and (iii) functionally graded titanium boride materials for high performance components and devices. These materials also have significant advantages over existing materials in the market in terms of manufacturability and low cost. Applications include titanium biomedical devices, bearings for aerospace, industrial and sports applications, armor and gun barrel applications.

ACCOMPLISHMENTS

A key accomplishment in 2004-05 is the creation of a new type of titanium boride material, nanostructured Titanium Boride Systems and the associated patent filing. The nanostructured titanium boride material is a novel, very high strength material that has higher reliability and lower cost of manufacturing compared to most conventional ceramics. Possible applications include armor and dies and inserts. Utah-based Ortho Development Corporation, continues to be a major supporter and beneficiary of the Center's work, targeting the development and FDA validation of orthopedic implants using the TiB coating - offering for the first time the potential for implants that last a lifetime, even with young recipients. In addition, the Center is pursuing commercial partnerships in the other fields of use, with very exciting potential partnerships developing.

THINK TANK

What if there was...

A way to make
lightweight
titanium boride
body armor to
protect police,
troops and security
forces? What if the
same material
could double the
life of a hip, knee
or spine
replacement joint?



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Petroleum Research

U N I V E R S I T Y O F U T A H

CENTER

The Petroleum Research Center (PERC) at the University of Utah conducts research and development studies leading to practical, cost-effective solutions to petroleum production, handling and transportation, especially for waxy and asphaltenic crude oils. In the current year, the development of a three-dimensional, three-phase fractured reservoir simulator with commercial potential was completed. This is the Center's final year in the program.

TECHNOLOGY

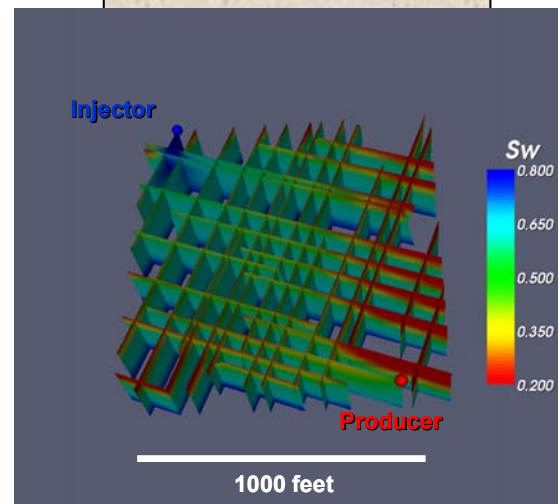
- PERC has developed a new Near-IR/Chemometrics method for crude oil properties prediction; good correlations were demonstrated for several properties. Commercial progress is underway to make suitable online instruments for field implementation.
- A series of comparison tests between oils and oil simulants were developed and catalogued which demonstrated the effectiveness of simulants as crude oil substitutes. The results were widely disseminated and results and samples were shipped to the U.S. EPA laboratories. Patent applications for the two simulant formulations were filed.
- A three-dimensional, three-phase reservoir simulator that models fractured reservoirs was completed.

ACCOMPLISHMENTS

Two patents for this Center were filed as well as an additional significant copyrighted work. The primary license agreements of this Center are with LT Industries, Inc., Gaithersberg, MD, Exxon Mobil, Fairfax, VA, Golder, Inc., Redmond, Washington.

THINK TANK

What if ...



Seamless integration of the simulation tool with a commercial fracture generation software system.

(Reservoir simulation results for a basement reservoir generated using the grid created by the fracture generation software, FRED from Golder.)

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Profitable Uses of Agricultural Byproducts

U T A H S T A T E U N I V E R S I T Y

CENTER

The Center for Profitable Uses of Agricultural Byproducts (CPUAB) located at Utah State University was established in 2000 to strengthen the rural economy by working closely with agricultural related businesses to transfer technologies that they need and want. In particular the Center works to transform agricultural waste products into useful items such as energy. This was the Center's final year in the program.

TECHNOLOGY

The main technology developed thus far at the Center is the induced blanket reactor (IBR) anaerobic digester. Electricity can be made from manure using the IBR. The manure produced by a typical 1000 cow dairy or 6000 pigs can produce enough electricity for 100 homes. Even more importantly, the major advantage of using the reactor is ease of manure handling and pollution control, including odor remission. Large farms are under increasing restrictions to use advanced waste treatment which includes managing nutrients, controlling odor and further minimizing the pollution potential of water and soil.

ACCOMPLISHMENTS

Andigen is a company that was started to market the technology developed at CPUAB, which includes two issued patents. Andigen has deployed four large IBR systems in Utah and Idaho with two more presently being built in Montana and California. Additional systems are planned for Southeastern Idaho, Ontario, Canada, and Southern California with a number of other locations in the negotiating stage. The company has a strong potential of being the largest supplier of farm scale anaerobic digesters in the US in the near future.

THINK TANK

What if there was...



**A system that could
improve the odor
control and waste
management of
large farming
operations that
could pay for itself
and even generate
a profit?**

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Representation of Multi-Dimensional Information (CROMDI)

U N I V E R S I T Y O F U T A H

CENTER

CROMDI was established in 2000 and has completed its final year as a Center, delivering technologies that facilitate the rapid and accurate analysis of large quantities of complex and quickly changing data. A crucial capability is the ability to correlate many seemingly unrelated inputs to identify a developing problem before it is a disaster. Areas of opportunity include process control, vehicle operation and traffic control, corporate management, quality assurance, medical visualization and network monitoring. Current successes include medical visualization, computer network security, homeland security and infrastructure security.

TECHNOLOGY

CROMDI's work is being commercialized in two key areas, the medical visualization and the security visualization industries. In the security industry, the VisAlert product is a visual data analysis tool that aids in the detection, diagnosis and remedy of computer security events across multiple logs. The visual paradigm correlates all information through the use of a plug-in architecture (new alert types and sensors can easily be integrated) and with

the "W⁴" paradigm, the *what*, *where*, *when*, and *who* of a network alert.

Before
Vs
After



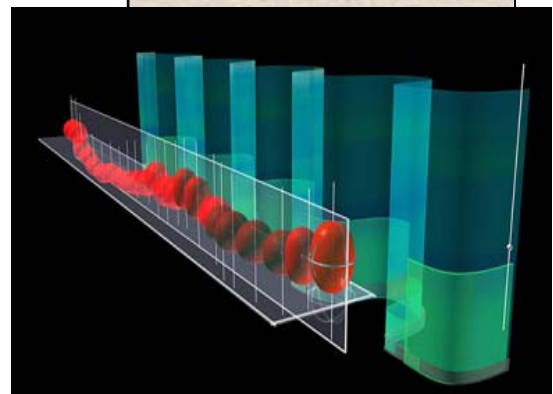
ACCOMPLISHMENTS

With two issued and many pending patents and disclosures, CROMDI has launched two spinout companies, Medvis (medvis.com), a 5 person company in the medical visualization industry, and Intellivis (intellivis.com) a new startup in the security visualization industry. CROMDI has received over \$5million in other contracts and grants and is being well received in the intelligence, military, and ISP communities.

THINK TANK

What if there was...

A way to help identify clusters of food born illness as they develop instead of after the fact? What if the same technology could help Railroads easily see when problems (or rail cars) begin piling up anywhere in the country?



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Smart Sensors

U N I V E R S I T Y O F U T A H

CENTER

This Center focuses on the creation of Smart Sensors, devices that combine sensor, signal processing, and computer solutions. These smart sensors probe the environment and then adapt their capabilities accordingly. This new generation of devices has applicability in medicine, agriculture, electronics manufacturing, wireless communication, transportation and radar. This is the Center's final year of support in the program.

TECHNOLOGY

The Center includes two core technology areas. The first core technology area is similar to a "mini-radar" system that measures length, distance, or impedance in a cable or circuit environment. These are cheap and simple. A successfully demonstrated application is for a "Smart Wire" in situ inspection system for aging aircraft wiring. Additional methods developed/developing in the Center include a tiny and inexpensive (\$2) timer circuit, capacitance sensors, an SWR meter, a direct sequence spread spectrum system, and correlation sensors based on communication theory.

The second core technology is the Imbedded Microstrip Antenna. The basic antenna design (a spiral or serpentine printed on a circuit board) can be adapted for either communication with buried objects (like cardiac pacemakers) or can be used for sensing (such as moisture of grain) and this year a combined design that can both sense and communicate was completed. The Center has developed a potential design for moisture measurement of soil for agriculture and water management, has identified Utah-based partners, and is actively pursuing a joint development project with a potential licensee.

ACCOMPLISHMENTS

A small Utah company, LiveWire Test Labs, Inc. has been established to act as the development partner for aircraft wiring test products and it has already received a number of Federal SBIR grants. Additional corporate partnerships are being developed with firms such as The Boeing Company, Texas Instruments, ATK (Brigham City) and Hamilton-Substrand (IL) as well as many others.

THINK TANK

What if there was...



**An easy, low cost
way to monitor
moisture content
throughout an
agricultural
field and adjust
irrigation
accordingly?**

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Therapeutic Biomaterials

U N I V E R S I T Y O F U T A H

Center

The Center for Therapeutic Biomaterials (CTB) prepares and uses new biomaterials for reparative medicine for the 3-D culture of human cells. The Center Develops applications of biopolymers and hydrogels for clinical use in wound repair, prevention of surgical adhesions, and extending the life of donated organs as well as permitting evaluation of cell response to various compounds. The compounds also have application in a variety of non-medical applications, such as cosmetics.

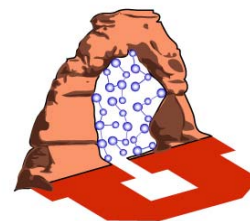
TECHNOLOGY

In year one, the CTB made substantial progress in engineering its core technology -- the synthetic extracellular matrix (sECM) -- in order to produce materials specific for each of the product areas above. The CTB achieved all of its technological specific aims. By developing materials for healing of acute and chronic wounds, bone and cartilage repair, sinus surgery, repair of ruptured eardrums, soft tissue reconstruction, engineering of functional liver tissue in vivo, revascularization of damaged myocardial tissues, and prevention of post-surgical adhesions.

Moreover, the Center established protocols for growth of primary rat liver cells in the 3-D sECM for drug testing in vitro, for obtaining and culturing primary human adipose-derived stem cells and human cancer cells in mouse xenograft models.

ACCOMPLISHMENTS

The Center's new chemical (HA) derivative (Carbylan™), received the 2005 Stoel Rives Innovation Award in Chemistry. Sentrx Surgical, Inc. was launched during the first year with an option to license from CTB, although licensing was not complete before the end of the reporting year. In addition, the CTB's spin-out company, Sentrx Surgical received three NIH STTR awards in the first year, totaling \$300,000 in total contracts. In 2004-05, the Director of CTB, Dr. Prestwich, delivered more than 15 invited academic talks and another 15 investor and corporate talks world-wide to promote the CTB's mission and foster commercialization of the technology. Another Utah firm, U.S. Tissue & Cell has an option to license to the skin life preservation technology.



Center for Therapeutic Biomaterials

THINK TANK

What if there was...

**A way grow cells
in culture that
allowed them to
behave like cells
inside the body?
And those cells
could now detect
drug toxicity or
mimic human
response to
compounds?**

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Program Description

PROGRAM DESCRIPTION

BACKGROUND

Recognizing that both the growth of new industry and the expansion of existing industry in the next century would require both a strong technology base and a steady supply of new ideas, concepts, innovations, and prototypes, the Utah State Legislature created the Centers of Excellence Program (COEP) in 1986. The Legislature has recommended the allocation of economic development funds annually to the COEP, generally to be awarded to college and university faculty on a competitive basis. The objectives of the COEP are to support the technical maturation of technologies that are considered to have potential for economic development in the state, and to assist in the actual commercialization of those technologies.

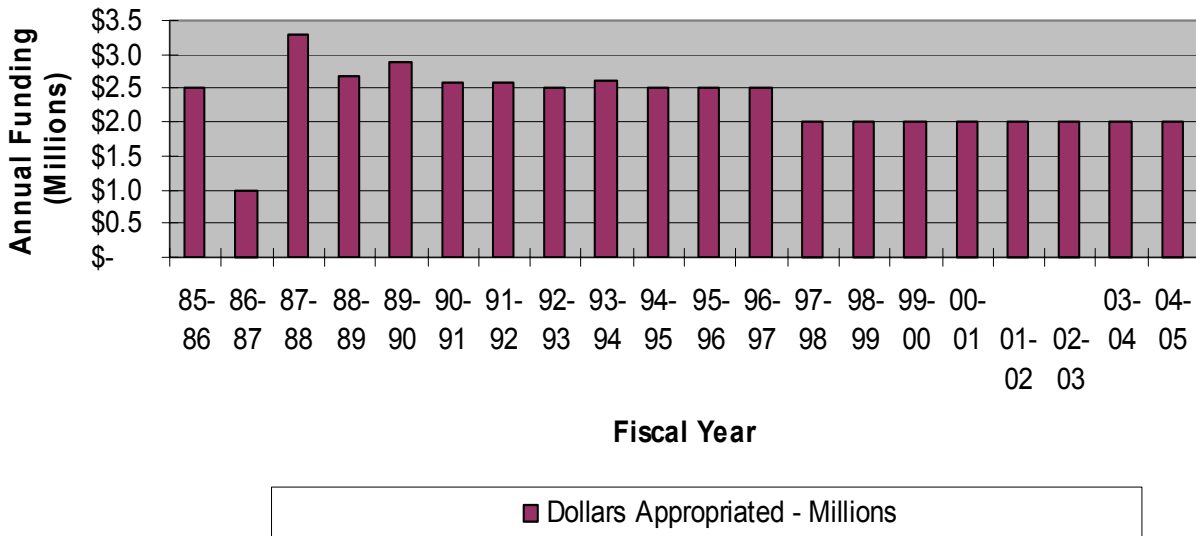
This research and technology commercialization process ultimately results in job creation through the creation of new companies and the enhancement of business opportunities for existing companies. In addition, the value of technologies created is reflected in the number of patents issued and the associated royalty-bearing licenses that are signed. The revenues received from licensing and from equity stakes in licensees of COE-supported technologies accrue directly to the licensing university, an attractive benefit of the COE program.

The State does not take or hold an equity position in the licenses. The return on investment to the state comes solely from the success of helping to convert university developed technologies into job and wealth creating products and services in successful businesses.

Ongoing funding of the program has varied during the years. The program started well funded at \$2.5 million and maintained approximately that level until 1996-97. However, since the 1996-97 fiscal year the program has been funded at the level of \$2 million, a level that has not grown, nor, unfortunately, has it kept pace with inflation.

On the next page, the chart shows the history of funding for the Centers of Excellence program, up to and including the 2004-05 Fiscal Year. Starting with 1985-86 funding level of \$2.5 Million, adjusted for inflation (see bls.gov/cpi), the Centers of Excellence program would have been funded with approximately \$4.45 Million in 2004-05.

Centers of Excellence Funding 1986-2005



It is to be hoped that positive momentum developing during the beginning of the 05-06 fiscal year can be continued. If funding for the Centers of Excellence program had kept pace with inflation since its inception in 1985-86 fiscal year, the funding level for 2005-06 would be roughly \$4.52 million.

Ongoing work with the Legislature to highlight successes of the program and its strong record of creating high paying jobs is expected to help strengthen its funding position over the coming years.

An important way to look at the Centers of Excellence program is to compare the investment made throughout the program's history with the number of jobs created in Utah. It is very difficult to track the jobs that have derived from over 100 Centers of Excellence over nearly 20 years.

In order to begin to quantify this job creation, in 2003 the Centers of Excellence program conducted a survey to attempt to quantify jobs resulting from the program with a particular emphasis on spinouts from the various Centers. This survey focused on companies linked to about 45 Centers and showed an actual count of 2008 jobs stemming from spinouts and licensees of Centers of Excellence.

Over the same period (through the end of the 2002-2003 fiscal year), the Centers program had invested \$42.14 million in the program for a net cost of \$20,987 per job created.

A modest extrapolation from the roughly 45 Centers surveyed to the full 101 Centers at the time, would yield an investment closer to the range of \$10,000/position created. This is similar to the range of job incentives provided when the state recruits a new company to our State. Updated statistics are expected to be compiled over the coming few years.

OPERATIONS AND OBJECTIVES

The goal of the Centers of Excellence program, particularly under the Huntsman administration, is clearly to help grow the economy of the state of Utah. As the new Director has said to every Center team and their business team colleagues, “our job is jobs.” In order to help foster job growth, the COE program emphasizes licensing of Centers-supported technology to either existing Utah business to help them develop innovative new products and services, or the startup of a new company (often called a spinout), specifically to take a new technology to market. The program continues to mentor Centers who have graduated, where possible, to help foster success, introduce them to sources of funding and identify management and other talent that might be of help to the Center.

Under the statute governing the 2004-05 funding year, Centers are required to have 2:1 matching funds. These funds are reported and reviewed on a regular basis. A key element of the program is the emphasis during the renewal and selection process of achievement of milestones and commitment to commercialization.

Center directors are required to submit annual reports to the COEP director. This Centers of Excellence Program Annual Report, begins with a summary of the reports prepared by each Center Director and is supplemented, as appropriate, by information gathered from site visits, meetings and other sources.

During this fiscal year, each Center was assisted by consultants who were selected and paid through a block grant from the COE program, by the technology transfer offices of the appropriate university, from a slate of approved consultants. These block grants estimated an average of 80 hours per year per Center of consulting time.

Consultants were assigned to assist the Center directors in defining and evaluating potential markets, helping to make industry connections and contacts and otherwise supporting the transition from university technology to market product. Admittedly, at such a modest funding level, consultants were not able to invest as much time as wisdom would dictate would be required to accelerate these technologies to success. However, even this level of funding is considered unique in the national environment of similar programs.

Ending with the 2004-05 Fiscal year, Centers had been funded up to a maximum of five years. Some Centers have emerged as ongoing Centers with national stature, some have terminated with the fruits of their work expressed in such companies as Myriad Genetics, Inc., Sonic Innovations, Inc., Theratech - Acquired by Watson Pharmaceuticals (WPI), and Echelon Biosciences Inc. - An Aeterna Zentaris Company (AEZS).

Beginning with the 2005-06 Fiscal year, the Centers of Excellence program targets funding up to a maximum of 4 years, at higher annual funding levels, with the goal of accelerating the commercialization of the technology. Some Centers entered the program with a target of only 2 years to successful commercialization, based on the needs of that Center.

CENTER SELECTION PROCESS

In late December, the COE program issues an RFP, advertised to the universities, their Technology Commercialization Offices (TCOs) and existing PI's and other industry contacts, as well as on the [COE website](#). In response to this RFP, prospective Center Directors as well as existing Center Directors prepare a proposal for either a new Center or for renewal of funding. The review process is a very demanding element of the Centers of Excellence program, but also demonstrates the strong support the program has among industry and the overall Utah community. Between 20 and 30 individuals with strong technology business backgrounds, all of them at the Director or VP level and above, volunteer to serve on the Centers of Excellence Advisory Council as Reviewers for the program. At least two reviewers, along with the Director and other GOED team members as appropriate, review the written proposal and then conduct a site visit and review. This meeting, usually several hours long, permits the Reviewers to hear directly from the Principal Investigators and their colleagues about the technology and business opportunity.

After all proposed centers have received a site visit and evaluation, the Reviewers gather for a one and a half day retreat of the full Council and discuss each of the proposals and recommend each proposal for funding, or not.

The State Advisory Council for Science and Technology (SAC) has advisory responsibility for the Centers of Excellence Program by statute. SAC members participate on the Centers Advisory Council, reviewing proposals and conducting site visits. This provides SAC members with in-depth knowledge of the program, Center specific information and a strong technical and industrial perspective for making funding recommendations. The SAC also reviews the Centers of Excellence Annual Report before its delivery to the Legislature and its being made available to the public.

In addition, the DBED Board (Department of Business and Economic Development Board) also provides members who participate in the COE review process. These members also are able to represent to the DBED board that the selection process has been fair and has been conducted in a way to help advance economic development in the state of Utah. For the 2004-05 funding year, the DBED Board had final approval, as a policy board, of the budget and budget allocation for the Centers of Excellence Program. The proposed Centers and their budgets were reviewed by the DBED Board and then a vote of approval was given.

COMMERCIALIZATION PROCESS

For a number of years, the Centers of Excellence Program has funded a consulting program to assist Center Directors in preparing and implementing commercialization strategies. Because of budget limitations, approximately 80 hours per year of consulting assistance was available to each Center. These funds were administered by each university's Technology Commercialization Office, which received a block grant of funds for all of their Centers. These funds were to be expended on "COE approved" consultants, of which there was a pool of approximately 20. These individuals ranged from general business consultants to some market specific consultants.

In general, the consultants were able to focus on a high level overview of a business plan or market survey and competitive analysis for the Center. Whenever possible, additional resources were brought in by the consultants, Center Director or TCO to further push the commercialization forward.

For the 2005-06 fiscal year, the consulting program has undergone a complete overhaul to result in the COE Business Team program. Under the Business Team program, seasoned technology executives, serial entrepreneurs and market experts are recruited through a statewide RFP to meet the specific needs of each Center. In addition, the funding level was increased to pay for approximately 250 hours of assistance per year for each Center, significantly increasing the ability of the Business Team members to help move the technologies out of the university and into industry.

A major objective of the Centers of Excellence program under the Huntsman Administration is to significantly increase the interaction between members of industry and university talent in order to facilitate the exchange of technologies and opportunities. Strong economies around the world are built around the movement of technologies from research institutions into industry, and the subsequent flow of funds and talent back to the institutions. It is the goal of the COE Director that the Centers of Excellence Program can help increase this virtuous cycle in Utah and further strengthen our high tech economy.

2004-2005 Financial Summary

The Financial Summary is a summary of the information provided by each Center in their annual report to the program and the funding summary is based on the funds granted during the fiscal year. For reference, “Total Funding” means COE funding since starting with the program, “Patents Pend. 04-05” means patents newly filed during the fiscal year, “New Patents (Issued)” refers to those issued during the fiscal year and “Spin-Offs/ Licensees” refers to companies which have been formed to “spin-off” technology from the Center while “Licensees” refers to companies which already existed which have licensed the technology.

University	Center	04-05 Funding	Total Funding	04-05 Matching	Patents Pend. 04-05	New Patents (Issued)	Spin-Offs/ Licensees
BYU	Advanced Communications Technology	110,000	110,000	766,203	3	0	0
USU	Advanced Imaging LADAR	134,900	269,900	297,190.25	1	0	2
USU	Advanced Satellite Manufacturing	25,000	25,000	50,960.09	0	0	0
UU	Advanced Strategies for Parasite Removal	135,000	135,000	270,000	1	0	0
UU	Biomedical Microfluidics	120,000	120,000	514,720	2	0	1
BYU	Compliant Mechanisms	56,000	546,000	302,500	0	2	Multiple licensees
UU	CROMDI	150,000	677,000	747,165	1	0	3
BYU	Direct Machining & Control	75,000	317,000	150,000	1	0	1
UU	Global Knowledge Mgmt.	120,000	233,000	318,557	0	0	0
USU	High-Speed Information Processing	149,500	409,500	488,250	0	0	3
UU	Homogeneous DNA Analysis	144,000	294,000	504,000	1	0	1
BYU	Miniature Unmanned Air Vehicles	110,000	110,000	808,643	0	0	1
UU	Nanosize Inorganic Material Powders	90,000	90,000	700,000	1	1	0
UU	Novel TiB Surface Hardening	85,000	157,000	200,000	1	0	1
UU	Petroleum Research	80,000	511,000	300,000	2	0	3
USU	Profitable Ag Byproducts	60,000	485,000	156,000	0	2	1
UU	Smart Sensors	112,500	557,500	486,000	1	1	1
UU	Therapeutic Biomaterials	130,000	130,000	\$1,254,968	0	0	2

2005-2006 Funded Centers

Utah Centers of Excellence Program

Description of Centers Selected for Funding in Fiscal 2005-2006

Center (University)

Acoustics Research (BYU)

Commercializing active sound control technology with superior ability to both reduce noise in varied settings (vehicle cabins, computer fans and telecommunications, e.g.) and modify sounds for commercial benefit.

Advanced Communications Technology (BYU)

Improved wireless communications and data transmission for both military and commercial markets is achieved through the use of MIMO (multiple-input multiple-output) technology with multiple antenna elements.

Advanced Imaging LADAR (USU)

Commercializing land-based and airborne high-resolution, laser-based 3D color-imaging platforms for both military and civilian use. One license to RapidMapper, Inc., a Utah company.

Advanced Satellite Manufacturing (USU)

Leveraging the capabilities of Utah's Space Dynamics Laboratory to develop and commercialize a low cost, modular small satellite platform for commercial, research, and military missions.

Alternate Strategies of Parasite Removal (U/U)

Preparing to commercialize a safe, nontoxic and rapid treatment for Pediculosis (head lice), a multibillion-dollar, increasingly resistant problem afflicting some 25% of children by the time they're teenagers.

Biomedical Microfluidics (U/U)

Engineering technology that controls the movement of fluids in channels smaller than a human hair; micro-pumps that can deliver tiny quantities of drugs and improved devices for DNA screening are some product examples. Wasatch Microfluidics, Inc., is being spun out.

Computational Design & Testing of Novel Materials (U/U)

Commercializing powerful computational packages capable of designing novel materials and predicting the electrical, mechanical and structural characteristics of electromechanical devices, especially nanostructured materials and components.

Global Knowledge Management (U/U)

Developing Knowledge Fusion and Dynamic Knowledge Refreshing software to enable next-generation data mining technology. A new startup company, Aculus, Inc., is being launched to market commercial implementations of some programs.

High-Speed Information Processing (USU)

Designing fast algorithms for Application Specific Integrated Circuits, which have value in most military and compact consumer electronic devices. An echo cancellation application enabled the creation of SP Communications, Inc. to make improved speaker phones in Logan, Utah.

Homogeneous DNA Analysis (U/U)

Developing a simple and inexpensive method for genotyping DNA samples from patients or disease organisms right in a doctor's office. One application licensed to Idaho Technologies, Inc. (a Utah company).

Interactive Ray-Tracing & Photo-Realistic Visualization (U/U)

Producing a commercial form of two programs that can process 3-D graphics based on large data sets found in CAD, film animation and scientific models, which existing GPUs cannot handle.

Magnetic Sensor & Actuator Materials (U/U)

Working to commercialize a novel magnetorestrictive alloy exhibiting a large physical effect in response to small magnetic fields, which may find use in applications from antilock brakes to nanomachining and ultrasonic devices.

Microarray Technology (U/U)

Developing a superior microarray platform for the molecular diagnostics and research markets with improved sensitivity, specificity and throughput.

Miniature Unmanned Air Vehicles (BYU)

Rapid design of airframes and miniaturized autopilot and guidance systems for tiny UAVs that can be operated by novices have earned the attention of both military and civilian agencies. An autopilot design has been licensed to Procerus, Inc. in Utah.

Modified Activated Carbons Technology (U/U)

Developing improved products for gas and water treatment, as well as metal recovery or removal, based on modifications to granular activated carbon.

Nanosize Inorganic Material Powders (U/U)

Commercializing a novel, cost-effective process (molecular decomposition) for the manufacturing of nanosize powders, the building blocks for myriad nanotechnology applications, as well as nanostructured ceramic membranes and other devices.

Therapeutic Biomaterials (U/U)

Developing applications of biopolymers and hydrogels for clinical use in wound repair, prevention of surgical adhesions, and extending the life of donated organs. One Utah company, Sentryx Surgical, Inc., has already been spun out of the Center.

Titanium Boride Surface Hardening (U/U)

Commercializing harder, longer-lived components and devices – ranging from armor to bearings and orthopedic implants - for the military, biomedical and industrial markets.

Pre-Center Candidates (Assigned a Business Team)**Acoustic Cooling Technology (U/U)**

Developing novel miniature acoustic power conversion devices without moving parts for energy recovery from waste heat.

Control of Flow in Manufacturing (USU)

Applying Computational Fluid Dynamics to improve manufacturing processes including particle sorting and Electrical Discharge Machining (EDM).

Direct Machining And Control (BYU)

Developing programming that allows a manufacturer to automatically optimize part production by adjusting for the actual specifications and tolerances of each item.

Legislation Governing 2004-05

Part 6

Centers of Excellence

9-2-601. Purpose.

9-2-602. Short title - Definitions.

9-2-603. Administration - Grants.

9-2-601. Purpose.

(1) The Legislature recognizes that the growth of new industry and expansion of existing industry requires a strong technology base, new ideas, concepts, innovations, and prototypes. These generally come from strong research colleges and universities. Technical research in Utah's colleges and universities should be enhanced and expanded, particularly in those areas targeted by the state for economic development. Most states are enhancing their research base by direct funding, usually on a matching basis. The purpose of this part is to catalyze and enhance the growth of these technologies by encouraging interdisciplinary research activities in targeted areas. The Legislature recognizes that one source of funding is in matching state funds with federal funds and industrial support to provide the needed new technologies.

(2) The Legislature recommends that the governor consider the allocation of economic development funds for Centers of Excellence to be matched by industry and federal grants on at least a two-for-one basis.

(3) The Legislature recommends that such funds be allocated on a competitive basis to the various colleges and universities in the state. The funds made available should be used to support interdisciplinary research in specialized Centers of Excellence in technologies that are considered to have potential for economic development in this state.

History: C. 1953, 63-62-1, enacted by L. 1985, ch. 103, § 1; 1986, ch. 109, § 1; renumbered by L. 1992, ch. 241, § 60.

9-2-602. Short title - Definitions.

(1) This part is known as the "Centers of Excellence Act."

(2) As used in this part, "Centers of Excellence" means university-based, industry-supported, cooperative research and development programs.

History: C. 1953, 63-62-2, enacted by L. 1985, ch. 103, § 2; 1986, ch. 109, § 2; renumbered by L. 1992, ch. 241, § 61.

9-2-603. Administration - Grants.

(1) This part shall be administered by the Division of Business and Economic Development.

(2) The department may award grants to the various colleges and universities in the state for the purposes of this part.

(3) Recommendations for funding shall be made by the division with the advice of the State Advisory Council for Science and Technology, with the approval of the board. Each proposal shall receive the best available outside review.

(4) In considering each proposal, the division shall weigh technical merit, the level of matching funds from private and federal sources, and the potential for job creation and economic development. Proposals or consortia that combine and coordinate related research at two or more colleges and universities shall be encouraged.

(5) The State Advisory Council on Science and Technology shall review the activities and progress of individual centers on a regular basis and assist the division in preparing an annual report on the accomplishments and direction of the Centers of Excellence Program.

History: C. 1953, 63-62-3, enacted by L. 1986, ch. 109, § 3; renumbered by L. 1992, ch. 241, § 62.

Repeals and Reenactments. - Laws 1986, ch. 109, § 3 repealed former § 63-62-3, as enacted by L. 1953, ch. 103, § 3, relating to creation of a committee for technology excellence in engineering research, and enacted the above section.

[92603].

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